



## > APPLIED DAIRY NUTRITION

Ration composition and nutrient contents have a great impact on the health and production performance of dairy cows. Variation in roughage and diet quality can have a large impact on this performance and can be used to manipulate production level. Better knowledge of the effect of dry cow nutrition gives you the tools to reduce the incidence of metabolic diseases and to improve health and fertility. Optimal levels of for example phosphorus and nitrogen help to reduce environmental impact of dairy production.

### Learning objectives

- To obtain knowhow to apply theoretical and practical nutritional knowledge to improve dairy performance
- To obtain knowhow to meet nutritional requirements of ruminants, as well as how to face the certain dilemma like efficiency, intestinal health and environment.

Schothorst Feed Research can provide presentations on various topics related to animal nutrition. A number of these presentations are shown in the list below. Of course, subjects can added to this list upon request. From the list below you can compose a program for your training. Of course we are happy to assist you in composing a suitable program for your group.

## Half day – full day modules

**Below modules can be scheduled for half a day up to a complete day. The length of the modules is adjusted in consultation with the client. The content of these modules will be tailored to the knowledge level and background of the participants**

### 1 Feedstuffs (multispecies)

Formulating animal feed is a complex task. Many different feedstuffs are available with very different nutritional characteristics. Nutritional quality and feed safety of feedstuffs need to be considered in formulating animal feed next to the cost price. Many typical characteristics of feedstuffs are not considered in linear programming, so that usage greatly depends on the knowledge and skills of the persons using the least cost formulation programs. This module brings feeding value, feed quality and feed safety together.

### 2 Feed evaluation

The different systems of energy and protein evaluation are explained in more detail. The availability at different places of the gastrointestinal tract and the utilization by the animal are discussed. This is further elaborated on the basis of calculation examples. Schothorst Feed Research has developed its own feed evaluation model for its customers (the E-dairy model). If desired, this presentation will discuss the background and development of the E-dairy model. Various examples of how feed materials are valued in this system are also explained.

### 3 Ration formulation

High yielding dairy cows require optimal management and ration composition. Feeding management has a clear impact on feed intake and production, health, fertility and longevity. To further optimise ration composition nutritionists formulate rations for the lowest costs possible while meeting all nutrient requirements and feedstuff restrictions at the actual market prices of feedstuffs. However, diet optimisation is not that simple. You always need to consider your specific situation including variation in forage quality and performance of the animals. The participants can hand in subjects in advance by sending an e-mail to [training@schothorst.nl](mailto:training@schothorst.nl). It is advised to schedule this module at the end of the training

## Short modules

**Below modules will take about 1.5 hours. Taking breaks and lunch into account 4 modules can be scheduled on a day. Of course also this modules will be tailored to the knowledge level of the participants.**

### **4 Anatomy and physiology of the gastrointestinal tract of ruminants**

To understand how nutrients are digested, it is important to understand how the gastrointestinal tract works. What is the function of the fore-stomach system, and what special properties does the ruminant have compared to monogastric animals, so that fiber-rich feeds can be converted into high-quality foodstuffs?

### **5 Structure of feeds and digestion**

The basic knowledge regarding the properties of feed materials fed to ruminants is discussed. The chemical composition of feed materials is discussed and a start is made with the explanation of the concepts of feed evaluation and utilization of feed by the ruminant.

### **6 Feed and water intake**

Cows do not always consume the same amount of feed and water at different times of lactation and under different conditions. For example, the quality of the water is important for the absorption. The feed intake models and factors influencing feed and water intake are discussed.

### **7 Ruminant digestion and metabolism using the E-Dairy model**

In this topic the principles of nutrient oriented feed evaluation are presented. From the composition and fermentation/digestion of nutrients in the rumen, small intestine and hindgut the aminogenic, glucogenic and lipogenic nutrients are derived. From these nutrients a new Net Energy system (the E-dairy® system) has been developed. This model is compared to other international feed evaluation systems.

### **8 Bypass protein and fat sources in ruminant nutrition**

High yielding animals require high energy diets containing bypass protein and fats. Many different sources of bypass protein and fat are available and differ in technological treatment. In this presentation several examples on the impact of specific treatments on rumen fermentation and intestinal digestion and the effect on nutritive value of these specific feedstuffs using the E-dairy model is presented.

### **9 Manipulation of milk production and composition**

Based on the E-dairy® system the effect of nutrients in the diet on feed intake and milk production is presented. Focus will be on milk lactose, protein, fat, fatty acid composition, free fatty acids and milk urea. The direct and indirect effects of nutrients on milk production performance will be described and discussed.

### **10 Effects of technological treatments on feeding value of grains**

Grains are an important source of glucogenic nutrients for high yielding dairy cows by fermentable carbohydrates but also of bypass starch. The effect and possibilities to use grains in dairy cow diets is largely dependent on the processing of grains. Technological treatment has an impact on both degradation and passage parameters. The effect of different technological treatments (e.g. grinding, pelleting, expanding, rolling, cracking) on the nutritional value of grains in the E-dairy® model are used as example.

## **11 Optimal transition cow management to reduce metabolic disorders**

The transition period in dairy cows is important to reduce the incidence and severity of metabolic diseases. In this presentation the relationship between nutrition in dry period and hypocalcaemia and ketosis is explained. Newest insight in feeding strategies to reduce problems in energy balance and mineral status are presented.

## **12 Prevention of subacute rumen acidosis and effects on locomotion and immune system**

In diets for high yielding dairy cows there is an increased risk for (subacute) rumen acidosis. Rumen acidosis does not only have a direct negative impact on animal production, but also on long term locomotion and occurrence of infectious diseases. The effect of feeding strategies on the occurrence of LPS in rumen and blood is proposed as mechanism behind those problems. Also feeding strategies to reduce these problems are presented.

## **13 Calf and heifer rearing**

Young stock is an important part of dairy farming because calves and heifers are the future dairy cows. Feeding strategies affect the rumen development, growth, maturation and, health of calves. Recent research on the effect of intensive milk replacer scheme's on growth and development will be discussed. Also, the impact of starter feed on rumen development and early nutrition on performance of dairy cows is presented.

## **14 Vitamins and minerals**

In addition to energy and protein sources, it is also important to provide the right amounts of vitamins and minerals. Vitamins and minerals have functions related to, for example, the immune system and fertility. The functions and the correct application of the vitamins and minerals are discussed.

## **15 Feeding strategies to improve fertility**

In this presentation the relationship between nutrition and health and fertility is described. The direct and indirect effect of nutrients on the hormone system is described and an overview of nutritional strategies to improve fertility is presented.

## **16 Nitrogen and phosphorus efficiency and methane emission**

The dairy industry has an important contribution to methane and ammonia emission, and nitrogen and phosphorus excretion to the environment. This presentation will focus on dietary strategies to reduce the environmental impact of ruminants. Focus will be on improving nitrogen efficiency and reducing ammonia emission, feeding low phosphorus diets and the strategies to reduce the excretion of methane by ruminants.

## **17 New insights in forage quality: effects of harvesting method and additives**

In this presentation the results of recent research toward forage quality are presented: the effect of chop length and harvesting method of corn on feed intake, digestibility and milk production, the effect of additives during the ensiling process and the effect of storage time on forage quality.

## **18 Feeding strategy for improving feed efficiency and protein utilization**

This presentation discusses which factors are important for feed efficiency and protein utilization. Based on data from SFR feed trials, it will be indicated how these parameters can be influenced via rations and what you can and cannot do with them on a dairy farm. The consequences of lowering protein levels in the ration are also discussed. How far can you go before feed intake, milk production and/or animal health is compromised?

## **19 Effect of technology on feeding value of raw materials**

The influence of various technological treatments (grinding, crushing, pressing, expanding, toasting, chemical treatments) on the nutritional value of raw materials is described. Specific effects on production and health parameters can be pursued through adapted feed value characteristics.

## **20 Mycotoxins**

Mycotoxins are present in almost all feeds and raw materials and have a negative effect on the animal. It is therefore important to know what mycotoxins are, where they occur and their main effects in different animal species. However, prevention of mycotoxins remains a challenge. What can we learn about the interactions of mycotoxins with other mycotoxins, with veterinary medicines, with feedstuffs and even the host microbiome.

## **21 Feed management during heat stress**

Dairy cows might have to deal with heat stress. In this presentation, the metabolic adaptations of the animal during heat stress are discussed and the different feeding strategies that can be used to limit the consequences of heat stress are discussed.

## **22 Role of buffers in rations for dairy cows**

During digestion in the rumen and metabolism in the dairy cow, it is very important to maintain the acid-base balance. The role of buffers and the importance for healthy rumen fermentation and metabolism is further explained in this presentation. This also discusses the translation into the buffering effect of feed materials and mineral buffers.